

1 **COMMUNICATING BETWEEN A DIGITAL VIDEO RECORDER (DVR) AND A SET**  
2 **TOP BOX (STB) TO COORDINATE THE DISPLAY OF A GRAPHICAL USER**  
3 **INTERFACE**  
4

5 **Cross Reference to Related Applications and Patents**

6 This application is related to co-pending U.S. patent application serial no. 09/652,730 filed  
7 on 08/31/200 entitled "ELECTRONIC PROGRAM GUIDE SUBSYSTEM FOR RECEIVING  
8 AND PROCESSING ELECTRONIC PROGRAM GUIDE INFORMATION FROM A SET-  
9 TOP BOX", the disclosure of which is herein incorporated by reference.

10 **BACKGROUND OF THE INVENTION**

11 **Field of the Invention**

12 The present invention relates to digital video recorders. More particularly, the present  
13 invention relates to communicating between a digital video recorder and a set top box to  
14 coordinate the display of a graphical user interface.

15 **Description of the Prior Art**

16 FIG. 1 shows a prior art digital video recorder or DVR 2 installed between a set top box or  
17 STB 4 (e.g., a tuner for digital cable) and a monitor 6. The STB 4 demodulates a selected  
18 channel from a program signal 5 and provides an audio and video (A/V) signal 7 to the DVR 2.  
19 The DVR 2 may record the A/V signal 7 for playback at a later time, or pass the A/V signal 7  
20 through to the monitor 6 as A/V signal 9. The DVR 2 further comprises a modem for receiving  
21 Electronic Program Guide (EPG) data over a telephone line 8. The user operates a remote  
22 control 10 to direct the DVR 2 to display the EPG data on the monitor 6 in a DVR graphical user  
23 interface (GUI). The user can peruse the EPG data in the DVR GUI to select various programs  
24 to view and/or record.

25 The remote control 10 is also used to control the operation of the STB 4; that is, the  
26 remote control 10 of the DVR 2 is intended to replace the remote control of the STB 4.  
27 Commands are sent from the DVR 2 to the STB 4 over a control line 12. For example, if the user

1 selects a new channel with the remote control 10, the DVR 2 commands the STB 4 to tune to the  
2 selected channel. In another example, if a program the user previously selected for recording  
3 begins to air, the DVR 2 directs the STB 4 to tune to the appropriate channel.

4 Multiple System Operators (MSOs), such as AT&T digital cable, as well as other  
5 broadband providers may not want the DVR 2 to commandeer the user interface. Broadband  
6 providers may want to retain their format for displaying the EPG data in order to minimize the  
7 burden on their viewers when a DVR is added to their system. Further, broadband providers  
8 derive revenue through advertising information displayed with the EPG data, and prior art DVR  
9 systems that replace the user interface may diminish the advertising revenue derived by the  
10 broadband provider.

11 There is, therefore, a need for a DVR compatible with existing STB hardware that can  
12 also accommodate the existing STB GUI.

### 13 SUMMARY OF THE INVENTION

14 The present invention may be regarded as a digital video recorder (DVR) for use with a  
15 monitor and a set top box (STB), the STB for demodulating program data from a program signal  
16 received over a communication channel and for generating a STB graphical user interface (GUI).  
17 The STB further comprises a DVR interface. The DVR comprises a local memory for storing the  
18 program data received from the STB, a STB interface for communicating with the STB over the  
19 DVR interface, and a DVR controller. The DVR controller for generating a DVR GUI, and in  
20 response to user input, communicating with the STB to coordinate whether the STB GUI or the  
21 DVR GUI is displayed on the monitor.

22 In one embodiment the STB interface implements a serial communication protocol, such  
23 as the Universal Serial Bus (USB) communication protocol. In another embodiment, the STB  
24 interface implements a 1394 communication protocol. In yet another embodiment, the DVR  
25 receives the program data from the STB.

26 In one embodiment, at least one of the STB GUI and DVR GUI display Electronic  
27 Program Guide (EPG) data. In one embodiment, the DVR further comprises a modem for

1 receiving Electronic Program Guide (EPG) data, the EPG data for display in the DVR GUI, and  
2 in an alternative embodiment, the DVR receives the EPG data from the STB.

3 In one embodiment, the STB receives a command from a remote control representing the  
4 user input. When the STB GUI is displayed on the monitor, the STB processes the command  
5 received from the remote control, and when the DVR GUI is displayed on the monitor, the STB  
6 communicates the command received from the remote control to the DVR. In an alternative  
7 embodiment, the DVR receives a command from a remote control representing the user input.  
8 When the DVR GUI is displayed on the monitor, the DVR processes the command received from  
9 the remote control, and when the STB GUI is displayed on the monitor, the DVR communicates  
10 the command received from the remote control to the STB.

11 In yet another embodiment, the DVR comprises a plurality of program identifiers  
12 identifying programs scheduled for recording by the DVR. The DVR communicates to the STB  
13 the plurality of program identifiers, and the STB is responsive to the plurality of program  
14 identifiers to display the STB GUI. In one embodiment, the DVR receives from the STB  
15 information identifying a program selected by a user from the STB GUI, and the DVR modifies  
16 the plurality of program identifiers using the information identifying the program selected by the  
17 user from the STB GUI. In yet another embodiment, the DVR comprises a plurality of program  
18 identifiers identifying programs recorded by the DVR. The DVR communicates to the STB the  
19 plurality of program identifiers, and the STB is responsive to the plurality of program identifiers  
20 to display the STB GUI.

21 In still another embodiment, the user input for displaying the STB GUI or the DVR GUI  
22 comes from a remote control comprising a first and second button for displaying the respective  
23 GUI. In an alternative embodiment, the STB GUI comprises an option for displaying the DVR  
24 GUI and the user input is generated by selecting the option to display the DVR GUI from the  
25 STB GUI.

26 The present invention may also be regarded as a set top box (STB) for use with a monitor  
27 and a digital video recorder (DVR). The DVR for storing program data received from the STB

1 and for generating a DVR menu. The DVR further comprises a STB interface. The STB  
2 comprises a tuner for demodulating the program data received over a communication channel, a  
3 DVR interface for communicating with the DVR over the STB interface, and an STB controller.  
4 The STB controller for generating a STB GUI, and in response to user input, communicating with  
5 the DVR to coordinate whether the STB GUI or the DVR GUI is displayed on the monitor.

6 The present invention may also be regarded as a computer program embodied on a  
7 computer readable storage medium for use in a digital video recorder (DVR), the DVR for use  
8 with a monitor and a set top box (STB). The STB for demodulating program data from a  
9 program signal received over a communication channel and for generating a STB graphical user  
10 interface (GUI). The STB comprises a DVR interface and the DVR comprises a STB interface  
11 for communicating with the STB over the DVR interface. The DVR further comprises a local  
12 memory. The computer program comprises code segments for receiving the program data from  
13 the STB, and storing the program data in the local memory. The computer program further  
14 comprises code segments for generating a DVR GUI, and in response to user input,  
15 communicating with the STB to coordinate whether the STB GUI or the DVR GUI is displayed  
16 on the monitor.

17 The present invention may also be regarded as a computer program embodied on a  
18 computer readable storage medium for use in a set top box (STB), the STB for use with a  
19 monitor and a digital video recorder (DVR). The DVR for storing program data received from  
20 the STB and for generating a DVR GUI. The DVR comprises a STB interface and the STB  
21 comprises a DVR interface for communicating with the DVR over the STB interface. The  
22 computer program comprises a code segment for demodulating the program data from a program  
23 signal received over a communication channel. The computer program further comprises code  
24 segments for generating a STB GUI, and in response to user input, communicating with the DVR  
25 to coordinate whether the STB GUI or the DVR GUI is displayed on the monitor.

## 26 **BRIEF DESCRIPTION OF THE DRAWINGS**

27 FIG. 1 shows a prior art DVR for use with a STB and a monitor, wherein the user

1 interacts only with the DVR GUI which replaces the STB GUI.

2 FIGs. 2A and 2B show an embodiment of the present invention wherein a DVR  
3 communicates with the STB to coordinate whether the monitor displays the STB GUI or the  
4 DVR GUI.

5 FIG. 2C shows a DVR according to an embodiment of the present invention as comprising  
6 suitable circuitry for displaying the A/V signal received from the STB (including the STB GUI),  
7 or the A/V signal generated internally (including the DVR GUI).

8 FIG. 2D shows an embodiment of the present invention wherein the DVR receives  
9 electronic program guide (EPG) data over a dedicated communication channel.

10 FIG. 3A shows an embodiment of the present invention wherein a STB receives  
11 commands from a remote control and forwards the commands to the DVR when the DVR GUI is  
12 displayed on the monitor.

13 FIG. 3B shows an embodiment of the present invention wherein a DVR receives  
14 commands from a remote control and forwards the commands to the STB when the STB GUI is  
15 displayed on the monitor.

16 FIG. 4A is a state diagram illustrating an embodiment of the present invention wherein the  
17 DVR and STB cooperate to enable user interaction with both the STB menu and the DVR menu.

18 FIG. 4B is a state diagram illustrating an embodiment of the present invention wherein the  
19 STB transmits a channel-change event to the DVR whenever the user controls the STB directly to  
20 change the tuned channel.

21 FIG. 5 shows an embodiment of the present invention wherein a DVR comprises an A/V  
22 file system for storing A/V data.

23 FIG. 6 is a flow diagram according to an embodiment of the present invention wherein the  
24 STB receives a list of programs recorded as well as programs scheduled for recording from the  
25 DVR and uses the program lists to display EPG data in the STB GUI.

26 FIG. 7A shows an example STB GUI according to an embodiment of the present  
27 invention comprising a program guide having indicators of the programs recorded by the DVR as

1 well as programs scheduled for recording by the DVR.

2 FIG. 7B shows an example DVR GUI according to an embodiment of the present  
3 invention comprising options for manipulating the DVR and an option for displaying the STB  
4 GUI.

5 FIG. 8 shows an example STB GUI according to an embodiment of the present invention  
6 comprising an option for displaying the DVR GUI.

## 7 **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

8 FIGs. 2A and 2B show a digital video recorder (DVR) 12 for use with a monitor 14 and a  
9 set top box (STB) 16 according to an embodiment of the present invention. The STB 16 for  
10 demodulating program data from a program signal 18 received over a communication channel and  
11 for generating a STB graphical user interface (GUI) 20. The STB further comprises a DVR  
12 interface 34. The DVR 12 comprises a local memory 22 for storing the program data received  
13 from the STB 16, a STB interface 24 for communicating with the STB 16 over the DVR interface  
14 34, and a DVR controller 26. The DVR controller 26 for generating a DVR GUI 28 (FIG. 2B),  
15 and in response to user input, communicating with the STB 16 to coordinate whether the monitor  
16 14 displays the STB GUI 20 (FIG. 2A) or the DVR GUI 28 (FIG. 2B).

17 In the embodiment of FIGs. 2A and 2B, the STB 16 comprises a tuner 30 for  
18 demodulating the program data from the program signal 18, and a STB controller 32 for  
19 generating the STB GUI 20 and for communicating with the DVR 12 to coordinate whether the  
20 STB GUI 20 or the DVR GUI 28 is displayed on the monitor 14.

21 The STB 16 may be a cable set top box for receiving cable signals, a satellite set top box  
22 for receiving satellite signals, or any other similar device for receiving the program signal 18  
23 carrying the modulated program data. The program signal 18 may be modulated at any suitable  
24 frequency, such as radio or optical frequencies, using any suitable modulation algorithm, such as  
25 quadrature amplitude modulation (QAM). The program signal 18 may be demodulated in  
26 continuous time wherein the modulated program data is transmitted in analog form, or  
27 alternatively, in discrete-time wherein the modulated program data is transmitted in digital form.

1 Further, any suitable compression algorithm may be employed to transmit the modulated program  
2 data, such as MPEG encoding.

3 In one embodiment, the DVR interface 24 and STB interface 34 implement a serial  
4 communication protocol, such as the Universal Serial Bus (USB) communication protocol.  
5 However, the interfaces may implement any suitable digital communication protocol, such as the  
6 1394 communication protocol.

7 In the embodiment of FIGs. 2A and 2B, the program data is communicated from the STB  
8 16 to the DVR 12 as separate audio and video (A/V) signals 35 which may be analog or digital.  
9 In one embodiment, the A/V signal 35 is communicated via a dedicated interface using a separate  
10 communication channel, and in an alternative embodiment the A/V signal 35 is communicated via  
11 the STB interface 34 and DVR interface 24 over a common communication channel, such as a  
12 1394 communication channel, as indicated by the dashed line 36 in FIGs. 2A and 2B.

13 The local memory 22 of the DVR 12 stores the program data (A/V signal 35) in digital  
14 form, and in one embodiment, in a compressed form such as MPEG. In one embodiment, the  
15 DVR 12 receives the A/V signal 35 in uncompressed form (analog or digital) and comprises  
16 suitable circuitry for performing the desired compression before storing the program data in the  
17 local memory 22 in compressed form. In an alternative embodiment, the DVR 12 receives the  
18 program data in compressed form for storing directly to the local storage 22. In the embodiment  
19 of FIGs. 2A and 2B, the DVR 12 further comprises suitable circuitry for decompressing the  
20 program data into an internal A/V signal supplied to the monitor 14 during play back.

21 FIG. 2C shows details of suitable circuitry implemented by the DVR 12 according to an  
22 embodiment of the present invention. The A/V signal 35 received from the STB 16 is encoded by  
23 encoder 21 (e.g., according to the well known MPEG format). The encoded program data 23  
24 may be stored by the local storage 22 for playback at a later time. A multiplexer 25 selects  
25 between the real-time encoded program data 23 or program data 27 stored by the local memory  
26 22, and the selected program data is decoded by decoder 29. The DVR controller 26 comprises  
27 an on-screen display module (OSD) 31 for generating the DVR GUI 28 in a layered manner,

1 including an A/V layer comprising the decoded A/V signal 33 output by decoder 29. An adder 41  
2 adds the decoded A/V signal 33 with the GUI data output by the OSD 31 to generate an A/V  
3 signal 43 representing the DVR GUI 28. A multiplexer 45 selects between the A/V signal 35  
4 received from the STB 16, the decoded A/V signal 33 output by decoder 29, and the A/V signal  
5 43 representing the DVR GUI 28. The multiplexer 45 outputs the A/V signal 37 supplied to the  
6 monitor 14. When the user selects the A/V signal 35 from the STB for display on the monitor 14  
7 (including the STB GUI 20), the multiplexer 45 selects the A/V signal 35 received from the STB  
8 16. When the user selects the DVR GUI 28 for display on the monitor 14, the multiplexer 45  
9 selects the A/V signal 43 representing the DVR GUI 28. When the user selects recorded program  
10 data for display on the monitor 14, the multiplexer selects the decoded A/V signal 33 output by  
11 the decoder 29. The DVR 12 may continue to record the A/V signal 35 received from STB 16  
12 independent of the user's selection as to which A/V signal is displayed on the monitor 14. This  
13 enables various trick-play features, such as pausing a real-time program.

14 In one embodiment the STB 16 transmits a control signal to the DVR 12 requesting  
15 "focus" of the monitor 14 when the user selects the STB GUI 20 be displayed. In this manner the  
16 DVR 12 will select the A/V signal 35 from the STB 16 for display on the monitor 14 rather than  
17 the A/V signal 33 or 43 generated internally by the DVR 12.

18 In the embodiment of FIGs. 2A and 2B, the STB 16 receives Electronic Program Guide  
19 (EPG) data 38 for use in rendering at least one of the STB GUI 20 and the DVR GUI 28. The  
20 EPG data 38 is digital data that may be sent to the STB 16 over a dedicated channel (e.g., over a  
21 telephone or cable modem, Ethernet, or other network channel) or over the same channel as the  
22 program signal 18 carrying the modulated program data. In one embodiment the EPG data 38 is  
23 communicated to the DVR 12 over the STB interface 34 and DVR interface 24. The DVR 12  
24 uses the EPG data to render the DVR GUI as described in greater detail in the above referenced  
25 patent application entitled "ELECTRONIC PROGRAM GUIDE SUBSYSTEM FOR  
26 RECEIVING AND PROCESSING ELECTRONIC PROGRAM GUIDE INFORMATION  
27 FROM A SET-TOP BOX". In an alternative embodiment illustrated in FIG. 2D, the DVR 12



comprises suitable circuitry for receiving the EPG data over a dedicated communication channel 49 (e.g., over a telephone or cable modem, Ethernet, or other network channel).

FIG. 3A shows an embodiment of the present invention wherein the STB 16 receives a command representing the user input from a remote control 40 (e.g., via an infrared interface). When the STB GUI 20 is displayed on the monitor 14, the STB 16 processes the command received from the remote control 40, and when the DVR GUI 28 is displayed on the monitor 14, the STB 16 communicates the command received from the remote control 40 to the DVR 12. In an alternative embodiment shown in FIG. 3B, the DVR 12 receives a command representing the user input from a remote control 40. When the DVR GUI 28 is displayed on the monitor 14, the DVR 12 processes the command received from the remote control 40, and when the STB GUI 20 is displayed on the monitor 14, the DVR 12 communicates the command received from the remote control 40 to the STB 16.

FIG. 4A is a state diagram illustrating an embodiment of the present invention wherein the DVR and STB cooperate to enable user interaction with both the STB GUI and the DVR GUI. When the system is initialized (powered on), the initial state 42 transmits a command to the DVR 12 to configure the DVR 12 so that the A/V signal 35 from the STB 16 is displayed on the monitor 14. The system then enters state 44 indicating that the STB 16 has focus of the monitor 14. At state 46 the system waits for user input (e.g., from the remote control 40). When user input is received, the system enters state 48 to evaluate the system mode. If the STB 16 currently has focus of the monitor 14, then at state 50 the user input is evaluated to determine whether the user has selected the option to display the DVR GUI. If not, the STB 16 processes the user input at state 52 to perform the appropriate STB function (e.g., change the tuned channel).

If at state 50 the user input indicates the user desires the DVR GUI to be displayed, then a command is sent to the DVR 12 so that the A/V signal generated internal to the DVR 12 (including the DVR GUI) is displayed on the monitor 14. That is, focus of the monitor 14 is transferred to the DVR 12 at state 54.

If at state 48 the DVR 12 has focus of the monitor 14, then the user input is

1 communicated from the STB 16 to the DVR 12 for processing. At state 56 the user input is  
2 evaluated to determine whether the user has selected the option to display the STB GUI. If not,  
3 the DVR 12 processes the user input at state 58 to perform the appropriate DVR function. The  
4 system then returns to state 46 to wait for more user input.

5 If at state 56 the user input indicates the user has selected the option to display the STB  
6 GUI, then the DVR 12 is configured to display the A/V signal 35 from the STB 16 and a  
7 command is communicated to the STB 16 to display the STB GUI. The system then enters state  
8 44 indicating that the STB 16 has focus of the monitor 14.

9 FIG. 4B is a state diagram illustrating an embodiment of the present invention wherein the  
10 STB 16 transmits a channel-change event to the DVR 12 whenever the user controls the STB 16  
11 directly to change the tuned channel. The state diagram of FIG. 4B is essentially the same as the  
12 state diagram of FIG. 4A with an additional state 60 which transmits the channel-change event  
13 from the STB 16 to the DVR 12 in connection with the STB 16 changing the tuned channel. In  
14 one embodiment, the channel-change event is transmitted to the DVR 12 before the STB 16  
15 actually changes the tuned channel. In this manner, the DVR 12 can warn the user that changing  
16 the tuned channel will affect the operation of the DVR 12, allowing the user to abort the  
17 operation if desired. In this embodiment, the DVR 12 transmits a control signal to the STB 16  
18 authorizing the STB 16 to change the tuned channel (or abort the operation).

19 In one embodiment, the DVR 12 comprises a plurality of program identifiers. The DVR  
20 12 communicates to the STB 16 the plurality of program identifiers independent of when the STB  
21 16 demodulates the program data identified by the plurality of program identifiers. The STB 16 is  
22 responsive to the plurality of program identifiers to modify at least one selected operation of the  
23 STB 16. In one embodiment, the plurality of program identifiers identify respective programs  
24 scheduled for recording by the DVR 12. In another embodiment, the plurality of program  
25 identifiers identify respective programs already recorded by the DVR 12. In one embodiment, the  
26 STB 16 uses the plurality of program identifiers to display the STB GUI, and in one embodiment,  
27 to display the EPG data. In another embodiment, the STB 16 uses the plurality of program

1 identifiers to demodulate the program data identified by the program identifiers.

2 FIG. 5 shows an embodiment wherein a DVR 51 comprises an A/V file system 53 for  
3 storing the A/V data. The STB 16 retrieves the plurality of program identifiers from the DVR 51  
4 by accessing the A/V file system 53.

5 In another embodiment, the DVR 12 receives from the STB 16 information identifying a  
6 program selected by the user from the STB GUI. The DVR 12 modifies the plurality of program  
7 indicators in response to the program selected by the user from the STB GUI.

8 FIG. 6 is a flow diagram illustrating the aforementioned embodiments. At step 62 the  
9 system waits until the user selects the option to display the STB GUI. At step 64 the STB 16  
10 receives EPG data from a communication channel (e.g., over the same channel as the modulated  
11 program data or over a dedicated communication channel). At step 66 the STB 16 receives from  
12 the DVR 12 the plurality of program identifiers. At step 68 the STB 16 renders the STB GUI  
13 using the EPG data and the plurality of program identifiers received from the DVR 12, and at step  
14 70 the STB GUI is displayed on the monitor 14. If at step 72 the user selects a program to record  
15 from the STB GUI, then at step 74 the EPG data identifying the selected program is transmitted  
16 to the DVR 12 and the DVR 12 updates the plurality of program identifiers so that the selected  
17 program will be recorded. Control then loops back to step 66 so that the STB GUI is updated to  
18 reflect the user's selection to record the program. The procedure exits when at step 76 the user  
19 elects to exit the STB GUI.

20 FIG. 7A shows a program guide displayed as part of a STB GUI according to an  
21 embodiment of the present invention. The program guide comprises a plurality of program  
22 identifiers for identifying programs broadcast on respective channels relative to the time of day  
23 (information derived from the EPG data). In addition, the program guide comprises recording  
24 indicators for identifying programs that have been recorded and programs scheduled for recording  
25 by the DVR 12. In one embodiment, the recording indicators are derived from the program  
26 identifiers received from the DVR 12. Displaying the program guide together with the recording  
27 indicators is not limited to the STB GUI; the program guide may be rendered by any suitable

1 video component capable of processing EPG data, such as the DVR 12 or the monitor 14.

2 In the example of FIG. 7A, the time of day is 9:15pm. The program "Jack and June" has  
3 been recorded as indicated by the icon 78 comprising two filled circles. The program "Sports in  
4 Review" is currently being recorded as indicated by the icon 80 comprising a filled circle and an  
5 empty circle. The program "GO Fast" is scheduled for recording starting at 9:30pm as indicated  
6 by the icon 82 comprising two empty circles. This modification enhances the program guide by  
7 providing the user with program recording information together with the program guide  
8 information. Otherwise the user must exit the program guide and display another menu (e.g., a  
9 DVR menu) to view the program recording information which is inconvenient.

10 FIG. 7B shows an example DVR GUI according to an embodiment of the present  
11 invention. The DVR GUI comprises an advertisement 84 and five user selectable options. The  
12 "What's on TV" option 86 displays a menu of programs currently being broadcast together with  
13 the prerecorded programs in a user preferred format. The "My Recordings" option 88 displays a  
14 menu of recorded shows together with EPG data such as the actors, director, and brief synopsis  
15 of each program. The "Program Guide" option 90 returns the user to the STB GUI (e.g., the  
16 STB GUI of FIG. 7A). The "Select Programs to Record" option 92 displays a menu that enables  
17 the user to search for programs to record. For example, the user may search for all "comedy"  
18 programs wherein the DVR GUI will display a list of all comedies broadcast over the available  
19 channels (as determined from the EPG data). The "Setup" option 94 displays a menu allowing  
20 the user to configure the DVR 12 (e.g., display movies in wide-screen or standard format).

21 FIG. 8 shows a STB GUI according to an alternative embodiment of the present  
22 invention. In this embodiment, the STB GUI comprises an option 96 for displaying the DVR GUI  
23 (e.g., the DVR GUI of FIG. 7B). In one embodiment, selecting the option 96 from the STB GUI  
24 is the only way to access the DVR GUI. In this manner, the user must go through the STB GUI  
25 to reach the DVR GUI ensuring that the content of the STB GUI (including advertising content)  
26 is always displayed to the user.

27 In another embodiment, the remote control 40 (FIG. 3A or 3B) for generating the user

1 input comprises a first button for selecting the STB GUI to be displayed on the monitor 14 and a  
2 second button for selecting the DVR GUI to be displayed on the monitor 14. This embodiment  
3 allows the user to quickly switch between the two GUIs by selecting the appropriate buttons on  
4 the remote control 40. Referring again to FIG. 3A, when the user presses the button to display  
5 the STB GUI, the STB 16 communicates a command to the DVR 12 requesting focus of the  
6 monitor 14 so that the DVR will display the A/V signal 35 generated by the STB 16, including the  
7 embedded STB GUI. When the user presses the button to display the DVR GUI, the STB 16  
8 communicates a command to the DVR 12 directing it to take focus of the monitor 14 by  
9 displaying its internal A/V signal (e.g., A/V signal 43 of FIG. 2C), including the embedded DVR  
10 GUI.

11 In one embodiment, the DVR 12 executes a computer program embodied on a computer  
12 readable storage medium (e.g., local memory 22). The computer program comprises code  
13 segments for receiving the program data from the STB 16, and storing the program data in the  
14 local memory 22. The computer program further comprises code segments for generating the  
15 DVR GUI 28, and in response to user input, communicating with the STB 16 to coordinate  
16 whether the STB GUI 20 or the DVR GUI 28 is displayed on the monitor 14.

17 In another embodiment, the STB 16 executes a computer program embodied on a  
18 computer readable storage medium (e.g., a non-volatile semiconductor memory connected to the  
19 STB controller 32). The computer program comprises a code segment for demodulating the  
20 program data from the program signal 18 received over a communication channel. The computer  
21 program further comprises code segments for generating the STB GUI 20, and in response to  
22 user input, communicating with the DVR 12 to coordinate whether the STB GUI 20 or the DVR  
23 GUI 28 is displayed on the monitor.